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May prolonged home confinement during the COVID-19 pandemic increase the prevalence and/or progression of myopia in school-aged children?

Pode o confinamento domiciliar prolongado durante a pandemia da COVID-19 aumentar a prevalência e/ou progressão de miopia em crianças em idade escolar?

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"Optimism is when we smile for the future 'because of'; hope is when we smile for the future "in spite of."
Rubem Alves

The coronavirus disease 2019 (COVID-19) pandemic has caused immense challenges worldwide[1]. To contain the contagion, many countries restricted the gathering and formation of crowds[2]. At the peak of the crisis, almost 1.6 billion children in 195 countries could not use their classrooms[3]. Students and other children are currently, wherever possible, educated at home all over the world remotely through the use of technology such as online courses, video classes, and electronic textbooks[3]. Brazil was one of the countries in which schools were closed for months; even today, 18 of the 26 Brazilian states maintain education only remotely[4].

Prolonged home confinement probably has a significant effect on the global incidence of myopia[5-8]. Many researchers believe that myopic progression has accelerated during the pandemic lockdown, but evidence to support this presumption is lacking[6]. However, myopia represents a serious public health concern for two main reasons[4]. First, uncorrected myopia is a major cause of visual disability in children, particularly in low- and middle-income countries, and, second, severe myopia among children is linked to a high risk of potential sight-threatening complications as they age.

In recent years, the use of computer screens has increased rapidly among young people[9,10]. Children's indoor activities and screen time have therefore increased, and their outdoor activities have decreased. Limited outdoor activity

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is known to be significantly associated with a higher incidence of myopia in school-aged children[11-13]. Interventional studies have revealed that increasing the amount of time spent outdoors decreases the incidence of myopia in children[12,14]. According to a 2012 meta-analysis of the existing literature, the odds ratio of developing myopia decreased by 2% for each additional hour spent outdoors per week[15]. In a 2020 review, Cao et al. concluded that more time spent outdoors helped slow down the change in axial length, as well as reducing the risk for myopia[16].

Myopia compromises the intellectual development of an individual not only in childhood but also throughout life. The proportion of people affected by myopia is expected to increase in the coming decades[17]. In Brazil, the prevalence of myopia has remained low so far, and the prevalence of severe myopia is even lower[18,19]. This situation raises the question of whether public health measures for the prevention of myopia progression are needed in Brazil as intensively as in other regions, such as East Asia; however, prevention of myopia in any individual is important[20]. This may be relevant particularly for the hereditary forms of myopia for which preventive measures are not yet available[20]. Increased time spent outdoors is the only intervention known to reduce the onset of myopia[20] and marked seasonal effects on myopia progression suggest that educational pressures and time outdoors may need to be regulated to prevent myopia[21,22].

A prospective cross-sectional study was carried out for 6 consecutive years (2015-2020) to investigate the refractive changes and prevalence of myopia in 123,535 schoolchildren aged 6-13 years from 10 elementary schools in Feicheng, China[8]. Because of the COVID-19 pandemic in 2020, these children were confined to their homes, and online courses were offered. The prevalence of myopia in 2020 was higher than that of any year during 2015-2019 for children aged 6 (21.5% vs. 5.7%, respectively), 7 (26.2% vs. 16.2%, respectively), and 8 (37.2% vs. 27.7%, respectively). Thus the prevalence of myopia in 2020 seemed to be approximately three times higher for 6-year-olds, twice as high for 7-year-olds, and 1.4 times higher for 8-year-olds. Such a substantial increase in the prevalence of myopia was not seen in older children (aged 9-13 years), although the older children (grades 3-6) were offered more intensive daily online learning courses (2.5 hours daily) than were the younger students (grades 1 and 2; 1 hour daily). These findings led investigators to hypothesize that younger children are more sensitive to environmental change than are older children[8], and thus among children aged 6-8 years, the plasticity of myopia is high, and its development may be easier to control. Beyond this age window, the plasticity of myopia is low, and the development of myopia is harder to control during environmental changes[8]. Is this myopic shift temporary or permanent? A recent study suggests that myopic progression was partially reversed after lockdown, which suggests that both accommodative characteristics and structural changes contributed to the accelerated rate of myopia[6].

The degree of myopia is directly associated with the risk of pathologic myopia[23]. The prevalence of pathologic myopia is only 1% to 19% among people with mild to moderate myopia (3 D), but its prevalence is as high as 50% to 70% among people with severe myopia[24,25]. A 1-D increase in myopia is associated with a 67% increase in the prevalence of pathologic myopia[26]. In addition to the degree of myopia, age is an important factor in the development of pathologic myopia[20]. Among myopic children, the age at myopia onset and the duration of myopia progression were the most important predictors of severe myopia in later childhood[20]. Strategies to delay the onset of myopia or the progression to severe myopia can be implemented in children with early onset of myopia, in whom the duration of progression is consequently longer. Encouraging children to spend more time outdoors may also be an appropriate strategy for very young children[8]; data from Singapore showed that in 10% of children with myopia, the onset was as early as 6 years of age, and the average age at onset of myopia was 8.5 years[27]. If future clinical trials confirm that refractive status may be more sensitive to environmental changes in younger children than in older children, increasing the time spent outdoors will be imperative.

Other interventions for reducing the progression of myopia in children have been studied extensively[28]. The use of atropine eye drops, multifocal soft contact lenses, orthokeratology, and a new type of multifocal spectacle have consistently shown benefits in preventing myopia[20]. Therefore, a postpandemic ophthalmological surveillance program for children with myopia should be based on demographic and clinical characteristics, risk factors, and individual preference in order to better control onset and progression of myopia[8].

In conclusion, prolonged home confinement during the COVID-19 pandemic was associated with a significant increase in myopia among Chinese children aged 6-8 years[8]. Young children are vulnerable to the development of myopia, and the refractive status in this population may be more sensitive to environmental changes[8]. Therefore, as long as home confinement is necessary, children's screen time should be limited as much as possible, and outdoor activity with safe social distancing should be increased.

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